Beyond the added-worker and the discouraged-worker effects: the entitled-worker effect

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Abstract

This paper identifies and analyses a new effect related to the cyclical behavior of labor supply: the Entitled-Worker Effect (EWE). This effect is different from the well-known Added-Worker Effect (AWE) and Discouraged-Worker Effect (DWE). The EWE is a consequence of one of the most important labor institutions: the unemployment benefit (UB). We develop a model with uncertainty about the results of the job seeking and transactions costs linked to such a search process in which a kind of moral hazard appears. This creates new incentives for workers and produces an additional counter-cyclical pressure on aggregate labor supply, but with a different foundation from that of the AWE. Finally, we show some empirical evidence supporting the EWE for the Spanish case.

Keywords: Labor force participation, Business Cycle, Unemployment, Added-worker effect, Discouraged-worker effect, Unemployment Benefit

JEL Classification: E24, E32, H55, J22, J64, J65

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1. Introduction

The analysis of cyclical movements in labor supply is essential to understand the size of the actual unemployment rate[1]. With the recent Great Recession or Global Financial Crisis, it has been clear that the business cycle is far from being under the control of the policymakers[2]. Therefore, the study of the cyclical evolution of the aggregate labor supply seems to deserve more attention. Now, with a deep recession on the near horizon because of the COVID-19 pandemic, this topic is likely going to become central to the political and scholarly debates. This issue is particularly important, not only, in countries with high unemployment levels, like Spain, which will be used as the lab to test the main hypothesis of this paper for this reason, but in many other countries.

In the literature, two effects have been considered traditionally regarding the cyclical movements of aggregate labor supply: the Added-Worker Effect (AWE) and the Discouraged-Worker Effect (DWE). Whereas the AWE predicts a counter-cyclical behavior of the participation rate (PR), the DWE predicts pro-cyclical changes on such an aggregate. If the former prevails over the latter, the official unemployment rate is considered to overstate the true unemployment during downturns and, if the DWE is stronger than the AWE, the unemployment will be understated. Recently, the traditional pro-cyclical behavior of labor supply in Spain has been losing strength. This puzzle has been "solved" by scholarly commentators by just arguing that the DWE is weaker and/or the AWE is stronger than before.

We do not agree with this simplistic way of reasoning, and the research question of this article might be formulated like this: is there another theoretical channel operating together with the AWE and the DWE accounting for the abovementioned facts? The answer would be affirmative. Thus, this work aims to identify, define accurately, and, finally, test a new effect related to the cyclical behavior of labor supply. This effect will be named the Entitled Worker Effect (EWE). The EWE is a consequence of the existence of a labor institution like the Unemployment Benefit (UB). This institution creates a specific type of moral hazard causing, workers to carry out an opportunistic behavior by supplying "fake" labor to be entitled to receive UB[3].

We build a microeconomic model of labor supply, and then we aggregate individual decisions to analyze macroeconomic fluctuations of labor

[1] Throughout the paper, we will use the terms labor supply and participation rate interchangeably. Of course, they are not the same. Whereas the labor supply is an absolute measure, the participation rate is a relative figure (active population as a percentage of the working-age population). In our model, we do not consider population changes, so in that case, and after normalizing total working-age to 100, both terms coincide.

[2] See, for example, Cover and Mallick (2012).

[3] Previous literature has documented significant issues of moral hazard in the Spanish public social insurance system, not only the UB (e.g., Moral-Arce et al., 2019) but also in the sick leave system (e.g., Martín-Román and Moral, 2016, 2017).

supply. This methodological approach connects this research to the so-called neoclassical model of labor supply. We utilize this model since it has been the common reference framework to study labor supply choices, particularly the decision to enter the labor market. Nevertheless, it is worth mentioning that several modifications are made to that model, some of them as little neoclassical as the introduction of involuntary unemployment. More precisely, we develop a model with uncertainty about the results of the job seeking, and with transaction costs linked to the search process in which a kind of moral hazard appears. Put differently, we combine an extended version of the neoclassical model of labor supply, with some elements from the job-search theory. In this conceptual framework, new incentives for workers arise, and they produce an additional counter-cyclical pressure on aggregate supply, but with a different foundation from that of the AWE.

As part of our approach, we also test the relevance of the EWE with Spanish data. Spain is an excellent "laboratory" due to its extremely high unemployment numbers[4]. At the same time, the cyclical fluctuations in the Spanish labor market are also enormous. Thus, the literature on Okun's Law for Spain has documented an astonishing large Okun's coefficient, close to one[5]. With these strong fluctuations in cyclical unemployment, the cyclical patterns in the PR should be easier to measure and identify.

Regarding the theoretical results, we develop a framework where we account for the theoretical channels through which the AWE, the DWE, and the EWE operate. The AWE is a direct result of the neoclassical model, as it comes from the conventional income effect since leisure is habitually considered a normal good. Accounting for the DWE in the model is somewhat less straightforward. This effect a consequence of involuntary unemployment. For that reason, we consider an expected utility theoretical framework, in which the likelihood of finding a job is determined precisely by the unemployment rate. Furthermore, job-search transaction costs are incorporated into the model because the job-seeking process is costly (in terms of a loss of leisure time). With these two features, we capture the notion of the DWE naturally. Nonetheless, the novelty of this paper is the idea of the EWE. This effect is a sort of moral hazard that arises from the existence of the UB. This labor institution creates economic incentives that might produce an additional counter-cyclical behavior of the PR. Nonetheless, as will be clear later on, it has nothing to do with the theoretical foundations of the AWE. Indeed, the theoretical channel through which the EWE operates is the change in the likelihood of finding a job (the same through which the DWE operates, but with the opposite sign), not the change in non-labor income. The main prediction of the model may be stated as follows: as more individuals are potentially entitled to receive UB, the countercyclical pattern of the PR is strengthened.

[4] See Cuéllar-Martín et al. (2019).
[5] See, for instance, Bande and Martín-Román (2018) or Porras and Martín-Román (2019).

As for the empirical results, they seem to give credit to the idea of a significant EWE in Spain in recent years. We provide some evidence supporting our hypothesis. Through three different econometric procedures to get a measure of the business cycle in the Spanish labor market, we observe a strong inverse correlation between the cyclical behavior of the PR and the percentage of potentially entitled workers to receive UB. Even though our empirical strategy is relatively straightforward, the findings are suggestive. The magnitude of the estimated correlation and the consistency of the outcomes using three distinct econometric methodologies point towards a relevant EWE.

The value-added of the paper consists in unveiling a theoretical link between the PR and the business cycle, one different from the AWE and the DWE. Although these two competing ideas arose several years ago, they still generate considerable new scientific production (e.g., Österholm, 2010; Congregado et al., 2011; Congregado et al., 2020; Martín-Román et al., 2020). Nonetheless, the bulk of this sort of research is empirically oriented. Our view is that, even though additional and clarifying empirical evidence would be welcome, in order not to interpret wrongly the true mechanisms driving the empirical evidence, a theoretical guide is needed. Furthermore, if the cyclical effects operating are not correctly identified, researchers might mislead policymakers when advising them with economic policy prescriptions (Granville and Mallick, 2009).

Thus, the economic policy implications of this research are pretty significant, remarkably when you take into account the volume of financial resources devoted to UB by governments in many countries. As will be shown, the EWE predicts a counter-cyclical behavior of PR. However, the theoretical foundations could not be more different from those of the AWE. The EWE leads to opportunistic behavior, generating a "fictitious" labor supply motivated by a labor institution such as UB. Needless to say that while it is difficult to fight against unemployment overestimation due to AWE from economic policy grounds, it is more feasible to reduce that overestimation because of the EWE by taking political action to monitor this behavior.

The rest of the paper is organized as follows. Section 2 is devoted to the background regarding the cyclical movements of labor supply, including a few basic concepts and the related literature. Section 3 presents the model to illustrate the EWE. There, the AWE and the DWE are characterized formally, and the EWE is obtained as a cross effect (i.e., a second-order effect). Section 4 explains the empirical strategy employed and shows the outcomes. Different approaches are followed to measure the business cycle, and all of them seem to support the theoretical framework developed in this research. Finally, section 5 concludes and discusses the results, giving special emphasis to the economic policy implications that can be derived from them.

2. Background

2.1. AWE versus DWE

The idea behind the AWE could be traced back to the final years of the Great Depression (Woytinsky, 1940; Humphrey, 1940). The argument behind this hypothesis is that when the family's breadwinner loses his/her job during a downturn, his/her spouse would have more economic incentives to participate in the labor market to replace the income lost. Although quite sophisticated models of family labor supply have been developed to explain this phenomenon[6], it can be easily formalized within the textbook model of labor supply (see next section).

Regarding the DWE, the works by Long (1953, 1958) outline the concept for the first time. It refers to situations in which workers' expectations about the results of the job search are so bad (during a downturn again) that workers give up seeking. Thus, those previously counted as unemployed workers are now considered out of the labor force. Consequently, we might state that DWE has to do with the uncertainty associated with the job-seeking process. The textbook model of labor supply is not accurate to conceptualize this effect for a very simple reason: it does not consider the uncertainty (associated with involuntary unemployment) about the result of the job search.

Although both the AWE and the DWE originally tried to describe the situation in the labor market during a downturn, when the economy is booming, the same phenomenon takes place, but with the opposite sign. The literature has established that the DWE is associated with the pro-cyclical behavior of the PR, and the AWE with the counter-cyclical fluctuations of the PR. Consequently, the DWE is related to an underestimation of the unemployment rate during the downturns and an overestimation during the booms. On the other hand, if the AWE prevailed, the "actual" unemployment rate would be higher than the official one during recessions (or weak economic growth periods) and lower during economic expansions.

Both effects might be operating at the same time throughout the business cycle. Thus, an observer would see the net effect when checking the data. To illustrate this idea, in panel (a) of **Figure 1**, we show a stylized business cycle (let us call it X) with a range of variation between -1 and 1 (i.e., $X \in [-1,1]$). This cyclical variable is depicted in a solid blue line. For instance, if we assume that every 1-percentage point increase in X causes a DWE of $+0.6$ percentage points (dotted red line) and an AWE of -0.4 percentage points, we might estimate econometrically a total net effect (TNE) of $+0.2$ percentage points. In this example, we have assumed that the DWE is stronger than the AWE, and, consequently, the TNE is positive.

[6] See, for instance, Pérez et al. (2015, 2020).

[Figure 1]

As regards the studies drawing on aggregate data and employing time-series econometric techniques, Elmeskov and Pichelmann (1993) estimate the elasticity of the participation rates to the business cycle, finding that the DWE is the dominant hypothesis. Darby et al. (2001) find that the DWE is prevailing, stronger in the downward phase of the cycle, and essentially a female phenomenon. Benati (2001), who produces empirical evidence on the existence of a significant DWE in the US labor market, reviews the literature on time-series econometrics too. This author states that seven studies (Long, 1953 and 1958; Hansen, 1961; Wachter, 1972, 1977; Goodman, 1974; Clark and Summers, 1982) do not reveal relevant evidence of pro- or counter-cyclicality in labor force or participation rates time series, except, for Long, under conditions of severe depression. One study (Wachter, 1974) is inconclusive. Two studies (Barth, 1968; Bowen and Finegan, 1969) present evidence of a weak DWE. Finally, five studies (Tella, 1964, 1965; Mincer, 1966; Perry, 1977; Clark and Summers, 1981) show evidence of a significant DWE[7]. Finally, Wasmer (2009) delves into the bidirectional relationship between unemployment and labor participation, confirming the inverse relationship between the participation rate and the unemployment rate, which gives support to the DWE.

Regarding the literature using cross-sectional analysis, Stephens (2002) finds evidence of the prevalence of the AWE in the long-term response of a wife's labor supply to her husband's job loss for the US economy. Bhalotra and Umana-Aponte (2010), also using microdata and referring to 63 developing and transition countries, find mixed evidence on the AWE and the DWE. They conclude, however, that the AWE is an important issue for certain socio-demographic groups and determined countries. Two papers pointing towards the relevance of the AWE for particular socioeconomic groups are Prieto-Rodríguez and Rodríguez-Gutierrez (2000, 2003).

Finally, Congregado et al. (2011), employing a threshold cointegration model to Spanish data, establish that the AWE dominates the DWE, but only when unemployment is below 11.7%. Although, for international standards, this threshold seems to be rather high, for the Spanish case is, in fact, quite low. Therefore, the conclusion is that the PR in Spain exhibits a low degree of cyclical sensitivity. Congregado et al. (2014) obtain evidence for a linear DWE for men. The AWE is statistically significant for women, but again, this only applies when the unemployment rates are below a certain threshold.

[7] The prevalence of the DWE over the AWE should be qualified. For instance, Parker and Skoufias (2004) detect a significant AWE for women in Mexico. Lee and Parasnis (2014) conclude that the DWE predominates in OCDE countries, whereas the AWE prevails in developing countries.

2.2. UB and labor supply

Textbooks on macroeconomics consider UB as one of the key determinants of natural unemployment. The underlying reason for that is that UB may affect the strength of workers' representatives by enhancing their power in the collective bargaining processes[8]. Thus, UB has been established to affect collective labor supply in unionized labor markets. Nevertheless, the theoretical avenue linking UB and labor supply that has attracted more attention among researchers has an individual basis: the job-search theory, which focuses on worker's behavior when looking for a job, a relevant dimension of labor supply.

The modern job-search theory arose in the 1970s (McCall, 1970; Mortensen, 1970). A good synthesis of this theory can be found in different surveys (e.g., Lippman and McCall, 1976a, 1976b; Mortensen, 1986; Mortensen and Pissarides, 1999; Rogerson et al., 2005; Rogerson and Shimer, 2011). Two elements of the job-search theory are particularly relevant for this paper, and thus, we incorporate them into the conceptual setting developed here. First, finding a job implies a search cost in terms of a loss of leisure that can be considered a transaction cost (i.e., to get a job, the worker has to look for one for some time). Second, and even more crucially, the result of that seeking process is uncertain (i.e., after the search, there is no guarantee of finding a job, and the worker might remain unemployed).

Job search models predict, in most cases, that the more generous UB is, the longer the unemployment spells among those UB beneficiaries are. This suggestive prediction has been tested overwhelmingly within the empirical literature. For example, the early bibliography on this issue, using macroeconomic data, establish a clear positive relationship between the generosity of UB and the unemployment level (e.g., Layard et al., 1991; Scarpetta, 1996; Nickell, 1997; Bassanini, 2006).

The microeconomic literature on this topic is even more extensive. Two surveying research works on this subject for the early literature are Atkinson and Micklewright (1991) and Pedersen and Westergård-Nielsen (2000). As a summary, the empirical evidence obtained detects significant effects of UB in the United States and the UK, and much weaker effects in Continental Europe (e.g., Holmlund, 1998; Nickell, 1979; Fallick, 1991; Ham and Rea 1987; Meyer, 1990; Katz and Meyer,1990; Hunt, 1995; Carling et al., 1996; Winter-Ebmer, 1998). A common denominator in the results of this literature is that when the entitlement for receiving the UB compensation is close to expiring, the likelihood of finding a job increases suspiciously. This outcome has been interpreted as a clear sign of duration moral hazard linked to UB.

More recently, a new strand of research has emerged to isolate the true causal effect of both entitlement and the replacement rate on labor supply. It

[8] See, for instance, Cabo and Martin-Roman (2019) for a formal analysis.

uses quasi-experimental designs, such as the differences-in-differences estimator or the regression discontinuity design. See, for instance, Card and Levine (2000) for the US, Carling et al. (2001), Bennmarker et al. (2007), Røed and Zhang (2003), Uusitalo and Verho (2010) for the Nordic Countries, Van Ours and Vodopivec (2006), Lalive et al. (2006), Card et al. (2007), Lalive (2007, 2008), Schmieder et al. (2012), Caliendo et al. (2013) for Central European countries, or Le Barbanchon (2016), Addison and Portugal (2008), Centeno and Novo (2006, 2009, 2014) for other European countries. The Spanish case also reveals significant disincentive effects associated with the UB (e.g., Bover et al., 2002; Rebollo-Sanz and García-Pérez, 2015; Rebollo-Sanz and Rodríguez-Planas, 2018). The main conclusion to be drawn from this literature is that there are notable consequences on the unemployment duration if the replacement rate or the potential benefit duration (PBD) changes. To sum up, an extension of the PBD lengthens unemployment duration by about 20% of such PBD time extension. Also, the elasticity of unemployment duration with respect to UB is estimated to be in the range of 0.4 to 1.0.

2.3. Hypothesis.

Economic incentives matter. The job-seeking behavior of individuals is influenced by both the replacement rate of UB and the entitlement to receive it. Thus, theoretical research has put much effort into modeling these issues. Dynamic macroeconomic models have been used to examine the relationship between unemployment, UB, and labor force participation. For example, Pries and Rogerson (2009) present a modified job-search model to account for labor force decisions. Another theoretical framework, closely related to the previous one, used to analyze the unemployment-participation relationship is real business cycle (RBC) models (e.g., Veracierto, 2008).

The theoretical setting developed in this article takes into account some of the features of this type of modelling, but, at the same time, makes changes to account for the EWE, without making the modelling process unnecessarily complex[9]. We are interested in incorporating into the model the idea of uncertainty associated with the seeking activity. This assumption implies that the individual may remain unemployed after the search and, hence, the notion of unemployment is added to the conceptual framework. Also, we are aware of the fact that job-search is costly for the worker and, consequently, we take into consideration this aspect into the setting.

In the previously mentioned literature, the focus is on the search process. Therefore, whereas the job search is modeled in detail, the treatment of the consumption-leisure substitution is kept relatively simple from an analytical point of view. Here, on the other hand, we make the opposite

[9] A different theoretical approach, away from the job-search theory, is adopted by Prescott (2004) and Prescott and Wallenius (2012).

decision, i.e., we put our attention on the consumption-leisure substitution (which is essential to understand the different nature of the EWE) and keep relatively simple the job search in the modeling task.

The job-search theory is intrinsically dynamic, but we do not need a dynamic model to illustrate how the AWE, the DWE, or the EWE operate. This is the reason why we adopt a static framework[10]. Our interest is not on duration moral hazard, as the dynamic job-search theory, but on incidence moral hazard[11]. We examine how the individual's labor supply behavior changes when he/she is a beneficiary of the UB, and how this fact ends up affecting the cyclical properties of the aggregate labor supply. The behavioral change analyzed is not dynamic in nature, as will be shown in a later section, and thereby the model used is static.

As will be proved, the EWE is a counter-cyclical effect operating only among those workers who are entitled to receive the UB. Therefore, the main hypothesis of the paper could be enunciated as follows:

> **Hypothesis 1:** *As the number of individuals entitled to receive the UB increases, so do the counter-cyclical forces affecting the PR cyclical pattern. Therefore, in a labor market A with a higher proportion of UB beneficiaries than in a labor market B, the PR should exhibit a less pro-cyclical or a more counter-cyclical behavior.*

The panel (b) of **Figure 1** illustrates **Hypothesis 1** graphically. We make a distinction there between a total net effect in a labor market without any UB beneficiary, TNE1, and a second scenario in which the number of UB beneficiaries increases progressively, TNE2. The panel (b) of **Figure 1** begins assuming a pro-cyclical pattern of PR. In the second scenario, however, as more and more individuals gain the right to collect UB, that pro-cyclical behavior weakens as a consequence of the EWE, ending up in a practically non-cyclical behavior of the PR.

3. The model

3.1. Theoretical framework

A labor market participation model is built based on the neoclassical framework of choice between leisure-work and consumption-income. As we are interested in the extensive margin of the labor supply, we consider a fixed working week. Hence, labor supply choices coincide with participation

[10] A few papers study how UB affects various aspects of labor supply from a dynamic standpoint. See, for example, Boone (2004), Boone and Van Ours (2006), or Cahuc and Fontaine (2009). None of them, however, model the same behavioral trait addressed in this paper.

[11] See, for instance, Moral-Arce et al. (2019) for a brief discussion on the types of moral hazard affecting the UB.

decisions (e.g., Boeri and Van Ours, 2013; or Cahuc et al. 2014). The model is extended here to account for the effects of unemployment (i.e., the likelihood of being in the labor force without a job), as in Martin-Roman et al. (2020). Likewise, this paper's model is additionally extended to address the influence of UB on the choice set for the individual.

The UB is considered here as an income linked to the job search. To receive the UB, workers need to spend some time engaged in job-search activities to prove their willingness to work to the unemployment office[12]. Therefore, unemployed workers are individuals who actively look for a job but do not find it. Thus, all UB beneficiaries are in the labor force. We also assume that if workers turn down a job offer, they might lose the right to receive UB with a determined probability.

The rest of the main assumptions of the model are listed below:

Assumption 1. *Labor is homogenous, i.e., the wage is the same for all workers*[13].

Assumption 2. *Labor contracts last one period.*

Assumption 3. *There exists a certain amount of time associated with labor participation. Before signing a new contract, the worker has to devote s units of time to job-search activities. Here, s is considered a fixed and exogenous sum of time*[14].

Assumption 4. *There exists a positive unemployment rate. That rate determines the likelihood p of finding a job, which is the same for all individuals*[15].

Assumption 5. *There are two kinds of individuals in the economy. Type-E workers are eligible to receive UB if they fulfill the requirements described below. Type-N workers are not entitled to receive UB. The percentage of individuals of both types is given at every moment*[16].

[12] In Spain, like in many other countries, to gain entitlement to UB, it is necessary to fulfill three requisites: (1) not having a job, (2) searching for a job, and (3) be willing to accept a suitable job offer within a brief period.

[13] The mechanism behind the wage formation (i.e., competitive forces, collective bargaining, or a mixture of both) is not significant here. Individuals are wage-takers, whatever the mechanisms for setting the wage to prevail in the economy.

[14] It is out the scope of the paper to consider s as an endogenous variable. That is the field of the job-search theory. See the previous section for some classical surveys on such a theory, or, more recently, Tatsiramos and van Ours (2012, 2014).

[15] In other words, unemployment is primarily involuntary. Obviously, the higher the unemployment rate, the lower is p.

[16] It would be possible to endogenize the percentage of type-E and type-N workers in the model. Nonetheless, such a model would require, at least, a two-period horizon. That model would add much complexity with a little gain in terms of predictive capability. For the sake of simplicity, we assume that past labor supply decisions have already been made and the percentages of type-E and type-N workers are given.

Assumption 6. *There exists a UB in the economy, denoted by b. Type-E individuals that have looked for a job for s units of time, without finding one, are eligible to UB. Furthermore, type-E individuals could reject a job if they found one. If this were the case, the employment authority might sanction the individual with the loss of the right to receive the UB. This occurs with probability $(1-q)$. With probability q, type-E individuals still receive the UB after turning down a job offer*[17].

Assumption 7. *The size of the working week, which we denote by $\bar{l}$, is fixed and exogenously determined*[18].

Assumption 8. *The utility function is additive. If we call C to the consumption (or the income because there is no saving) and H to the leisure time (i.e., total time minus hours of work), we have: $U(C,H) = \Lambda(C) + \Omega(H)$. As usual, marginal utilities are supposed to be positive and decreasing*[19].

The set of alternatives for the worker is shown in **Figure 2**. Inside the utility function, the levels of consumption (C) and leisure (H) have been replaced by the corresponding values associated with each decision. Thereby, we are already taking into account the budget constrain within the framework of choice. As mentioned, w is the real wage per unit of time, $\bar{l}$ stands for the duration of the fixed working week, y is the real non-labor income, b is the UB, and s stands for the job-search duration linked to the participation decision. The total disposable time has been normalized to 1.

[Figure 2]

From now onwards, type-E individuals will be our baseline reference, who are potentially eligible to receive UB in case of not finding a job after a search process (i.e., $b > 0$). The analysis of type-N individuals is just a particular case: we only have to assume that $b = 0$. When necessary, we will highlight the differences in behavior between both groups.

According to **Figure 2**, a type-E individual has three options. Each of these options is associated with a level of utility, certain or expected: (1) not to participate,

(1) $$U(y, 1),$$

(2) to participate and reject a job offer if they find one,

[17] This is the origin of the moral hazard we will elaborate later on.
[18] As mentioned before, since we are interested in the extensive margin of the labor supply, this assumption allows us to focus on the participation decision.
[19] This assumption is less restricting than it seems. Within the ordinal utility theory, a logarithmic transformation of the very well-known Cobb–Douglas utility function is also additive, representing an identical set of preferences.

(2) $$p\big(qU(y+b,1-s)+(1-q)U(y,1-s)\big)+(1-p)U(y+b,1-s),$$

which could be also written as

$$U(y+b,1-s)\big(pq+(1-p)\big)+U(y,1-s)p(1-q),$$

and (3) to participate and accept a job offer in case of finding one.

(3) $$pU\big(w\bar{l}+y,1-\bar{l}-s\big)+(1-p)U(y+b,1-s)$$

3.2. Opportunistic supply of labor (moral hazard)

From expressions (1) to (3), it can be deduced that the worker is going to participate in the labor market whenever expression (4) holds:

(4) $$U(y+b,1-s)\big(pq+(1-p)\big)+U(y,1-s)p(1-q)\geq U(y,1)$$

This is so regardless of the real wage prevailing in the labor market. Although the wage were $w=0$, the individual would participate because the expectancy of collecting UB would compensate for the time spent in job-search activities. In such a case, the individual would deal with labor participation as a game. Such a game offers him/her the opportunity of winning a prize (UB), with a likelihood $\big(pq+(1-p)\big)$, in exchange for a cost: it is necessary to search for a job during s units of time. Nevertheless, individuals know that whether they had the "bad luck" of coming across a job, they would turn it down.

The critical value of the UB (b^*) that induces workers' participation in any circumstances is the one that solves the equation (5):

(5) $$U(y+b^*,1-s)\big(pq+(1-p)\big)+U(y,1-s)p(1-q)=U(y,1)$$

In other words: if $b\geq b^*$, individuals will opt to look for a job (i.e., they will choose to participate), regardless of the wage existing in the market (because in some circumstances they will turn down the job offer). Put differently, if $b\geq b^*$, the reservation wage would be zero ($w^R=0$). Needless to say that the reservation wage (w^R) has its usual interpretation here.

At this point, the following question arises: assuming that $b\geq b^*$, when is a job offer going to be accepted or rejected? After finding a job, an individual will take it whenever the earnings linked to such a post compensate for the leisure time lost associated with the working week. Nonetheless, we need to point out that the choice of accepting or turning down a job offer does not depend on p. Expression (6) displays the critical wage that equals the utility of accepting or declining a job offer:

$$(6) \qquad U\left(w^*\bar{l}+y, 1-\bar{l}-s\right) = qU(y+b, 1-s) + (1-q)U(y, 1-s)$$

We dub "acceptance wage" to w^* so as to differentiate it from the notion of reservation wage explained above[20]. It is evident that if $w \geq w^*$, individuals accept the job, and if $w < w^*$, they reject it. Something that will prove useful later is to know how w^* depends on b. From expression (6), we may define an implicit function and demonstrate that w^* is an increasing and concave function of b when represented in the space (w, b) as we do in **Figure 3**.

[Figure 3]

$$\frac{\partial w^*}{\partial b} = \frac{qU_C(y+b)}{\bar{l}U_C\left(w^*\bar{l}+y\right)} > 0$$

$$\frac{\partial^2 w^*}{\partial b^2} = \frac{qU_{CC}(y+b)}{\left(\bar{l}U_C\left(w^*\bar{l}+y\right)\right)^2} < 0$$

From the preceding discussion, it can be deduced that there exists an opportunistic labor supply for specific values of b and w. If $b \geq b^*$ and $w < w^*$, individuals will participate in the labor market (they will supply a positive number of working hours $\bar{l}$), but this a "fictitious" labor supply since those working hours cannot be hired by the employers in the economy. From a different standpoint: the UB creates economic incentives that change individuals' behavior resulting in a moral hazard issue.

3.3. UB and labor supply

Let us now consider the case when $b < b^*$. How is the participation threshold determined under these circumstances? If that were the situation, it would be nonsense that individuals participate (experiencing a leisure time loss due to the search transaction costs) to reject the job that they could find. An individual would participate so as to accept the job. Formally, as the utility value of (2) is lower than that of (1), the only reason for an individual to participate is that the utility value of (3) is higher or equal to that of (1). Consequently, expression (7) provides the participation threshold:

$$(7) \qquad pU\left(w^+\bar{l}+y, 1-\bar{l}-s\right) + (1-p)U(y+b, 1-s) = U(y, 1)$$

Therefore, we have a two-tier reservation wage. Expression (8) summarizes this situation:

[20] Both of them may be deemed as thresholds to make a decision. We could state that our reservation wage here suits the idea of reservation wage of the very well-known (static) neoclassical model of labor supply, whereas our acceptance wage is slightly related to the notion of reservation wage of the (dynamic) job-search theory.

(8) $$w_E^R = \begin{cases} 0 & if\ b \geq b^* \\ w^+ & if\ \ b < b^* \end{cases}$$

Where w_E^R is the reservation wage for a type-E individual. It is convenient to go deeper into the characteristics of w^+ to understand all the implications of the model. Firstly, it is possible to prove that w_E^R is a decreasing and concave function of b. From expression (7), and making use of the implicit function theorem, we obtain:

$$\frac{\partial w^+}{\partial b} = -\frac{(1-p)U_C(y+b)}{p\bar{l}U_C\left(w^+\bar{l}+y\right)} < 0$$

$$\frac{\partial^2 w^+}{\partial b^2} = -\frac{-(1-p)U_C(y+b)p\bar{l}^2U_{CC}\left(w^+\bar{l}+y\right)}{\left(p\bar{l}U_C\left(w^+\bar{l}+y\right)\right)^2} < 0$$

Secondly, it is easy to see that $w^+ > w^*$ holds (obviously for $b < b^*$, that it is when w^+ is really defined). The proof can be carried out by using the definitions in expressions (6) and (7). Thus, from condition (7), we implicitly know that: $U\left(w^+\bar{l}+y, 1-\bar{l}-s\right) > U(y,1) > U(y+b, 1-s)$. On the other hand, it is evident that: $U(y+b, 1-s) > U(y, 1-s)$. As a consequence, we obtain: $U\left(w^+\bar{l}+y, 1-\bar{l}-s\right) > qU(y+b, 1-s) + (1-q)U(y, 1-s)$. Finally, the previous expression together with condition (6) implies that: $U\left(w^+\bar{l}+y, 1-\bar{l}-s\right) > U\left(w^*\bar{l}+y, 1-\bar{l}-s\right)$. Or, in other words, $w^+ > w^*$ provided that $b < b^*$.

Figure 3 depicts these outcomes. In that figure, the space (w, b) is divided into four parts. A type-E individual whose combination of w and b were located in the zone (II) would never participate. If his/her combination of w and b were located in the zones (I) or (III), he/she would participate. Furthermore, he/she would accept a job in the case of finding one. Finally, the zone (IV) illustrates those situations of moral hazard abovementioned. If it were the case, a type-E individual would enter the labor market, but to reject a job offer in any instance.

In **Figure 3**, it is also depicted the reservation wage for a type-N individual (w_N^R). Formally, this would be a particular case of the more general expression (7). That is, making $b = 0$ in (7), we obtain expression (9):

(9) $$pU\left(w_N^R\bar{l}+y, 1-\bar{l}-s\right) + (1-p)U(y, 1-s) = U(y,1)$$

From (9), it is clear that w_N^R is always positive ($w_N^R > 0$)[21]. As depicted in **Figure 3**, w_N^R coincides with the maximum value of w_E^R, reached precisely

[21] Focusing first on leisure time, we have that $1 > (1-s) > (1-\bar{l}-s)$. This would entail that $w_N^R\bar{l} > y$ to obtain equality in (9), which in turn implies that $w_N^R > 0$.

when $b = 0$. As w_N^R does not depend on b, it is a horizontal line in the space (w, b) represented in **Figure 3**.

3.4. Aggregation process

Now, let us study the aggregation process. Assuming that workers have different preferences over consumption-income and leisure-work, different non-labor incomes, and there are differences in their entitlement to receive UB, they will have diverse reservation wages. This heterogeneity of reservation wages $w^R \in [0, +\infty)$ might be represented by a cumulative distribution function $\phi(\cdot)$. If the rest of the PR determinants do not change (i.e., non-labor income, the likelihood of finding a job, and the UB), the aggregate labor supply could be expressed in formal terms according to (10):

$$L = N \cdot \phi(\cdot) \tag{10}$$

Where L stands for the labor force and N stands for the total working-age population. The PR is simply $\phi(\cdot)$, as expressed in equation (11):

$$PR = \frac{L}{N} = \phi(\cdot) \tag{11}$$

Since $\phi(\cdot)$ is a cumulative distribution function, by definition, it is increasing in its argument, $\phi_w > 0$. Nevertheless, as shown below, not only the non-labor income but also the likelihood of finding a job and the UB play a significant role in determining PR because they do change. To incorporate this idea, let us call w_M^R the reservation wage for the median individual within the cumulative distribution. Thus, expression (12) describes a stylized PR function:

$$PR = \phi(w, w_M^R) \tag{12}$$

As mentioned, $(\partial PR/\partial w) > 0$ by definition. On the other hand, consistent with the concept of reservation wage $(\partial PR/\partial w_M^R) < 0$. It is worth recalling that w_M^R is, in turn, a function of some additional arguments. In the model developed here, w_M^R depends on y, p, and b. Besides, we have to point out that both $y(X)$ and $p(X)$ are regarded as functions of the business cycle (X). We assume that if the business cycle X is booming, the state of the economy improves, whereas when X decreases, the economy worsens[22]. As a conclusion, we may rewrite expression (12) as follows:

$$PR = \phi(w, w_M^R[y(X), p(X), b]) \tag{13}$$

[22] Later on, we devote some additional effort to explain how we measure X in statistical terms and its implications.

Equation (13) reveals that PR depends on the business cycle through a double channel. On the one hand, cyclical variations in the median worker's non-labor income give rise to the AWE. On the other hand, cyclical changes in the likelihood of finding a job result in the DWE. More importantly, equation (13) also shows that the level of UB may cause a cross effect or second-order effect ($\partial^2 PR/\partial X \partial b$), which is the origin of the EWE, as explained in greater detail below.

3.5. The Added-Worker Effect

During an economic downturn, some breadwinners lose their job. As a consequence, their spouses would experience a reduction in their non-labor incomes which, in turn, would reduce their reservation wages and, at an aggregate level, the PR would rise. The opposite would happen otherwise. Furthermore, this counter-cyclical behavior of PR would induce an overestimation (underestimation) of the "true" aggregate unemployment rate in downturns (upturns).

This classical result (i.e., the AWE) fits well in our theoretical framework. First, let us analyze type-E individuals. Making use again of the implicit function theorem and computing how w^+ depends on y, we obtain:

$$\frac{\partial w^+}{\partial y} = -\frac{pU_C\left(w^+\bar{l}+y\right)+(1-p)U_C(y+b)-U_C(y)}{p\bar{l}U_C\left(w^+\bar{l}+y\right)} > 0 \tag{14}$$

It is straightforward to derive the positive sign in (14). The denominator is positive. As regards the numerator, a realistic assumption is that $w^+\bar{l} > b$, which implies that $w^+\bar{l}+y > b+y > y$[23]. Since the marginal utilities are decreasing, $U_C(y) > U_C(b+y) > U_C\left(w^+\bar{l}+y\right)$. A linear combination of $U_C(b+y)$ and $U_C\left(w^+\bar{l}+y\right)$ is less than $U_C(y)$, and, together with the minus sign affecting the whole fraction, (14) has a positive sign.

The effect of y on b^* has also to be studied so as to obtain a complete description of type-E individuals. Using the implicit function theorem again, we have:

$$\frac{\partial b^*}{\partial y} = -\frac{U_C(y+b^*)\left(pq+(1-p)\right)+U_C(y)p(1-q)-U_C(y)}{U_C(y+b^*)\left(pq+(1-p)\right)} > 0 \tag{15}$$

Finally, it is also necessary to know how w^* changes when y varies, maintaining constant b (and the rest of the factors affecting w^*):

[23] The assumption of $w^+\bar{l} > b$ fits the facts. See, for instance: http://www.oecd.org/social/benefits-and-wages.htm

$$\frac{\partial w^*}{\partial y} = -\frac{U_C\left(w^*\bar{l} + y\right) - qU_C(y+b) - (1-q)U_C(y)}{\bar{l}U_C\left(w^*\bar{l} + y\right)} > 0 \tag{16}$$

Expressions (14) to (16) characterize the behavior of type-E individuals when non-labor income changes, and that is depicted in **Figure 4** (taking a reduction in y as the reference).

[Figure 4]

The analysis of type-N individuals is easier. From equation (9):

$$\frac{\partial w_N^R}{\partial y} = -\frac{pU_C\left(w_N^R\bar{l} + y\right) + (1-p)U_C(y) - U_C(y)}{p\bar{l}U_C\left(w_N^R\bar{l} + y\right)} > 0 \tag{17}$$

The positive sign in (17) implies a downward shift of the horizontal line representing w_N^R **in Figure 3** (recall that the reference is a decrease in y).

From the previous discussion, it is quite evident that if we pooled together type-E and type-N individuals, a reduction of the non-labor income (as a consequence of a downturn) would decrease the reservation wage of the median worker. This fact, in turn, would encourage labor participation. In more formal terms, and maintaining constant p when the business cycle varies (to disentangle the different effects), we may describe the AWE through (18):

$$\left.\frac{\partial PR}{\partial X}\right|_{\bar{p}} = \frac{\partial PR}{\partial w_M^R} \cdot \frac{\partial w_M^R}{\partial y} \cdot \frac{\partial y}{\partial X} < 0 \tag{18}$$

since we know that $\partial y/\partial X > 0$ (by hypothesis), that $\partial w_M^R/\partial y > 0$ (from the discussion in this section), and that $\partial PR/\partial w_M^R < 0$ (from the concept of reservation wage).

3.6. The Discouraged-Worker Effect

The original idea of the DWE establishes that when the likelihood of finding a job falls, some workers quit active job search (i.e., they become inactive), and the opposite occurs otherwise. The rationale behind this is that as the expectations of finding a job worsen, the transaction costs linked to the search process could exceed the expected benefits since these diminish. Therefore, the PR would exhibit a pro-cyclical pattern, and, as a consequence, the "actual" unemployment rate would be underestimated (overestimated) in slumps (in booms).

The way of formalizing the DWE within the model is through p. For the sake of simplicity, and to disentangle the DWE from the EWE, we focus on type-N individuals in this subsection. Evidently, in a world with $b = 0$ for

every worker, there is no place for the EWE. Thus, behavioral changes caused by cyclical movements in p can be identified with the DWE in this theoretical setting[24].

Looking at the reservation wage condition for type-N individuals summarized by equation (9), it is straightforward to compute the effects of changes in p on w_N^R:

$$(19) \qquad \frac{\partial w_N^R}{\partial p} = -\frac{U\left(w_N^R\bar{l} + y, 1 - \bar{l} - s\right) - U(y, 1 - s)}{p\bar{l}U_C\left(w_N^R\bar{l} + y\right)} < 0$$

The negative sign of (19) is the result of the definition given in (9). First, $U(y, 1) > U(y, 1 - s)$. Second, in order to achieve equality in (9), $U\left(w_N^R\bar{l} + y, 1 - \bar{l} - s\right) > U(y, 1) > U(y, 1 - s)$ has to be fulfilled. Put in other words: when p rises (drops), w_N^R decreases (increases).

Thus, a stylized mathematical version of the DWE may be written through expression (20):

$$(20) \qquad \left.\frac{\partial PR^N}{\partial X}\right|_{\bar{y}} = \frac{\partial PR^N}{\partial w_M^R} \cdot \frac{\partial w_M^R}{\partial p} \cdot \frac{\partial p}{\partial X} > 0$$

with the superscript N referring to an economy composed exclusively by type-N individuals. In expression (20), the level of non-labor income has been maintained constant. As before, we can affirm that $\partial p/\partial X > 0$ (by hypothesis), that $\partial w_M^R/\partial p < 0$ (from the discussion in this section), and that $\partial PR^N/\partial w_M^R < 0$ (from the concept of reservation wage).

3.7. The Entitled-Worker Effect

The model developed can simultaneously rationalize and formalize the AWE and the DWE by means of expressions (18) and (20), respectively. However, the real novelty of this article is to rationalize and formalize the EWE, which operates through the same channel as the DWE (i.e., changes in p) but entails a counter-cyclical behavior of the PR (like the AWE).

As the EWE is exclusively linked to UB, we primarily focus on type-E individuals in this subsection. The behavior of type-E individuals is summarized by w_E^R, which, in turn, depends on the function $w^*(b)$. From condition (6), it is clear that w^* is not affected by changes in p. Nevertheless, that does not imply that b^* is not affected either. From expression (5), we have:

[24] Indeed, when the DWE was proposed first, the UB system was much less generous than now. Thus, the EWE should have been less important than it might be today in modern welfare states.

$$\frac{\partial b^*}{\partial p} = -\frac{(q-1)\big(U(y+b^*,1-s)-U(y,1-s)\big)}{U_C(y+b^*)\big(pq+(1-p)\big)} > 0 \tag{21}$$

The positive sign in (21) determines a direct relationship between p and b^*. Finally, to complete the analysis of type-E individuals, it is necessary to establish how w^+ varies when p changes:

$$\frac{\partial w^+}{\partial p} = -\frac{U\big(w^+\bar{l}+y,1-\bar{l}-s\big)-U(y+b,1-s)}{p\bar{l}U_C\big(w^+\bar{l}+y\big)} \gtreqless 0 \tag{22}$$

The sign in (22) can be either positive or negative. This is due to the ambiguity of the numerator since $U\big(w^+\bar{l}+y,1-\bar{l}-s\big) \gtreqless U(y+b,1-s)$. The denominator is always positive. However, it is still possible to reach some conclusions about the pattern of w^+ when p changes. First, let us compare $U(y+b,1-s)$ with $U(y,1)$. Whereas $U(y+b,1-s)$ is an increasing function of b, $U(y,1)$ does not depend on b. Consequently, it is feasible to find a level b^+ for which $U(y+b^+,1-s)=U(y,1)$. For $b<b^+$, we have $U(y+b,1-s)<U(y,1)$, and for $b>b^+$ the following relationship $U(y+b,1-s)>U(y,1)$ holds. We have to point out that always $b^+<b^*$. This result comes from the definition of b^* in equation (5), which implies that $U(y+b^*,1-s)>U(y,1)$. As, by hypothesis, we have $U(y+b^+,1-s)=U(y,1)$, it follows that $U(y+b^*,1-s)>U(y+b^+,1-s)$, and accordingly that $b^+<b^*$. In other words, when $b<b^+$, expression (22) has a negative sign, and a positive sign when $b>b^+$. Evidently, when $b=b^+$ we have that $U\big(w^+\bar{l}+y,1-\bar{l}-s\big)=U(y+b,1-s)=U(y,1)$, and (22) equals zero.

The implications for the type-E individuals' reservation wage of the above discussion are shown in **Figure 5** (with a reduction in the likelihood p as the reference). For low levels of UB (i.e., for $b<b^+$), the response of the reservation wage would be qualitatively the same as that of type-N individuals: a decline in p causes a rise in the reservation wage. **Figure 5** also displays the change of w_N^R, although it is just a shift upwards of a parallel to the X-axis line, because w_N^R does not depend on b. Nonetheless, for UB levels high enough (i.e., for $b>b^+$), the relationship between the probability of finding a job and the reservation wage turns around, and we obtain a direct association between p and w_E^R. This is the basis for the EWE: some type-E individuals could be encouraged to look for a job when the perspectives of finding one are worsening because of the institutional prerequisite abovementioned so as to receive the UB payments, which creates the moral hazard issue already explained in subsection 3.2.

[Figure 5]

To sum up, in a world with only type-E individuals, some of them would be encouraged (discouraged) to search for a job when the business cycle improves (worsens), but others would be discouraged (encouraged). Formally:

$$\left.\frac{\partial PR^E}{\partial X}\right|_{\bar{y}} = \frac{\partial PR^E}{\partial w_M^R} \cdot \frac{\partial w_M^R}{\partial p} \cdot \frac{\partial p}{\partial X} \gtreqless 0 \tag{23}$$

with the superscript E referring to a world made up only of type-E individuals. Precisely, what we dub EWE is the possibility of a negative sign in (23).

3.8. The Total Effect

Now, we analyze the three effects jointly. To better understand how the EWE operates, let us imagine a world without UB (i.e., let us suppose that $b = 0$ for all the individuals as in subsection 3.6). In this case, there would be no difference between type-E and type-N individuals. Indeed, all potential workers in the economy might be considered type-N individuals. Assuming, for instance, that the labor market is heading to a cyclical trough, then the likelihood of finding a job falls, and the non-labor income of the median worker decreases. Equations (18) and (20) explain how the PR would respond to this situation. As a consequence of the DWE, the PR should fall. And because of the AWE, the PR should experience an increase. What the researcher may observe directly through the data is the net effect. If we assume, for example, that the DWE is stronger than the AWE, a reduction in the PR would be estimated through econometric methods. This is the scenario depicted in **Figure 1 (a)** in section 2.

If we relax the assumption of $b = 0$ for all potential workers, the difference between type-E and type-N individuals emerges. And, as proved before, these two types of individuals behave differently. For this reason, let us define the proportion of type-E individuals within the total working-age population, θ, as (24) indicates:

$$\theta = \frac{N^E}{N^E + N^N} \tag{24}$$

with N^E and N^N being the number of type-E and type-N individuals, respectively.

In expression (13), it is shown that the level of UB affects the median worker's reservation wage and so the PR. On the other hand, exogenous changes in θ affect the level of UB for the median worker[25]. Given that we

[25] A higher proportion of type-E workers raises the UB level for the median worker directly because the type-N workers are associated with a level $b = 0$. There are mainly two channels through which the proportion defined in (23) may change systematically: first, legislative changes favoring the entitlement to the UB; and, second, structural changes in the working-age population, creating a more work-committed pool of potential workers (since the entitlement is related to previous work experience).

will use an empirical version of θ to test our model in the next section, we switch from (13) to expression (25):

(25) $$PR = \phi(w, w_M^R[y(X), p(X), \theta])$$

which constitutes a key relationship for the empirical strategy.

Traditionally, the literature on this topic has attempted to determine the sign of (26):

(26) $$\frac{\partial PR}{\partial X} = \beta \gtreqless 0$$

or, put differently, to determine whether the DWE prevails over the AWE or vice versa.

The model developed here, in contrast, has defined a second-order theoretical effect, the EWE, which may be summarized mathematically through (27):

(27) $$\frac{\partial^2 PR}{\partial X \partial \theta} = \frac{\partial \beta}{\partial \theta} < 0$$

The negative sign in (27) is deduced from the discussion in subsections 3.5, 3.6, and 3.7. If the starting point is, for example, the prevalence of the DWE over the AWE, the higher the proportion of type-E individuals within the working-age population is, the less pro-cyclical the PR is. This is so because while all type-N individuals will react pro-cyclically to changes in p, some of the type-E individuals will respond pro-cyclically and others counter-cyclically.

This situation is represented in the panel (b) of **Figure 1.** There, we considered two alternative settings for the Total Net Effect (TNE). The first one (TNE 1) only takes into account the aggregation of the AWE and the DWE. This would be the case of an economy without UB (i.e., b = 0 for all the individuals). In scenario 2, the Total Net Effect (TNE 2) incorporates the existence of UB. The underlying assumption behind this second theoretical setting is that the proportion of type-E individuals within the working-age population is monotonically increasing throughout the period considered. Formally:$(\partial\theta(t)/\partial t) > 0$, where t stands for time.

If we interpret β in expressions (26) and (27) as the estimated sensitiveness of the PR to the business cycle (e.g., assuming linearity), what the panel (b) of **Figure 1** shows is that:

(28) $$\frac{\partial \beta\big(\theta(t)\big)}{\partial t} = \frac{\partial \beta}{\partial \theta} \cdot \frac{\partial \theta}{\partial t} < 0$$

In words: as the proportion θ increases, the EWE becomes stronger and stronger. For this reason, the pro-cyclical profile of TNE 2 is less pronounced as time goes by. The second cycle peak (trough) is less sharp than the first one, and the third peak (trough) is almost negligible. More importantly, this decline in the pro-cyclical sensitivity of PR is a consequence of the EWE, not the AWE. This is the main theoretical outcome of this paper, which will be tested in section 4.

4. Empirical evidence

4.1. Database

To test the central hypothesis posed here, we need statistical information on the PR to be used as the dependant variable in the regressions. Furthermore, as a cyclical indicator, we use the unemployment rate (UR) of prime-age males (35-to-44 age group). In doing so, we minimize the potential problems of simultaneity and reverse causality. Data for PR and UR come from the OECD database[26]. The information about the number of UB beneficiaries comes from the Spanish Ministry of Labor administrative registers[27]. These are all very well-known series.

Nevertheless, three comments regarding the PRs are worth noting. First, we utilize the 16-to-64 age group PR. First, despite the OCDE dubs this group 15-to-64, in Spain, the minimum working age is 16. Second, although it is possible to find figures before the year 1980 for the Spanish PRs within the OECD database, we limit our analysis to the period 1980-2019 since the number of UB beneficiaries started to be recorded in 1980. Finally, as shown below, there is a relevant discontinuity in the year 2001 due to a notable methodological change in the definition of unemployment, affecting labor force definition as well. For this reason, we include in the econometric regressions a dummy variable that takes value 1 in the year 2001 and 0 otherwise trying to capture such a methodological change, and it proved to be very significant[28].

4.2. Empirical strategy

As the theoretical effect that we attempt to identify is a second-order effect, our empirical strategy consists of two steps. In the first one, we estimate a set of cyclical sensitivities for the PRs in different periods. We implement this stage employing a rolling-window procedure. In the second step, we correlate the coefficients obtained in the first one with an empirical measure of the proportion of type-E individuals in the economy.

[26] http://www.oecd.org/
[27] http://www.empleo.gob.es/index.htm
[28] We also tried to identify other relevant methodological changes in the series, but no one proved to be very significant.

We have already established that the PR depends on the business cycle (X) and other factors (Z). Thus, we can represent the PR as a general function of a cyclical variable X and a vector Z, as shown in (29):

$$PR = f(X, Z) \tag{29}$$

We also assume that the business cycle affects the PR in the short run, whereas the rest of the factors comprised in the vector Z influence the PR in the long run. Furthermore, we model econometrically the general function (29) as the linear equation (30):

$$\Delta PR_t = \alpha^{LS} + \beta^{LS} \cdot \Delta UR_t + \varepsilon_t \tag{30}$$

In expression (30), ΔPR_t is the first difference of the PR between year t and year $t-1$. The coefficient α^{LS} reflects a constant linear trend underlying the data and would capture all those long-run factors comprised in the vector Z. On the other hand, ΔUR_t is the first difference of UR times minus 1. We change the sign of ΔUR_t so as to obtain a cyclical indicator for the labor market that varies directly with the booms and downturns of the economy, which facilitates the interpretation of the results. Finally, ε_t stands for a random error term. We denote by β^{LS} the sensitiveness of variations in PR to movements in UR since we calculate it by means of a Least Squares procedure. This approach follows closely that of the popular research work by Pencavel (1987). It is simple and easy to interpret[29]. At the same time, it is flexible enough to make use of the estimated β^{LS} in the second step of our empirical strategy, as will be shown later.

In order to check the robustness and the sensitivity of our analysis, we also carry out two additional empirical exercises. With these methods, we first detrend the series and then focus on the cyclical components of them. In doing so, we avoid the misleading results associated with spurious correlation as a consequence of the time trends of the series.

Two alternative filters are employed. The first one is the Cubic Trend (CT) method. We estimate the time trend of the series with a polynomial of degree 3, and the residuals of that regression are assumed to be the cyclical component of the series[30]. In equation (31), $PRCT_t$ and $URCT_t$ are cyclical components of the PR and the unemployment rate (times minus 1). β^{CT} is the sensitiveness of changes in PR to movements in UR.

$$PRCT_t = \alpha^{CT} + \beta^{CT} \cdot URCT_t + \varepsilon_t \tag{31}$$

[29] Moreover, as shown later on, the time-series in (30) turned out to be $I(0)$ in first differences (i.e., they are stationary). Thus, we prevent the problems associated with spurious correlation.

[30] We also detrended the series with a polynomial of degree 2 (i.e., we use the Quadratic Trend method). However, the cyclical components thus obtained were not stationary.

The second filtering method is the Hodrick-Prescott (HP) filter, using $\lambda = 100$, as suggested by most of the literature for annual data. As in the previous case, we regress the cyclical component (the gap between the original series and the HP trend) of participation rates ($PRHP_t$) on the cyclical component of the prime-age male unemployment rate ($URHP_t$) in equation (32)[31]:

$$PRHP_t = \alpha^{HP} + \beta^{HP} \cdot URHP_t + \varepsilon_t \tag{32}$$

Figure 6 is the graphical representation of the time series used in this study. A necessary step to take is to ensure that the series used are stationary, otherwise the estimation of equations (30) through (32) would provide flawed results due to a spurious relationship among the involved variables. We compute standard unit root tests for each of the series employed in the empirical analysis. This is displayed in **Table 1**. Three different well-known tests have been computed: Augmented Dickey-Fuller (ADF), Phillips-Perron (PP), and Kwiatkowski-Phillips-Schmidt-Shin (KPSS)[32]. Overall from Table 1 we find that our series are $I(0)$ or stationary and hence the estimates attained from (30) through (32) are reliable.

[Figure 6]

[Table 1]

Comparing and contrasting estimates from (30) through (32) allows us to obtain a point estimate of whether the PR is pro-cyclical or counter-cyclical. However, to test the theory developed in this paper, we have to elaborate more on the empirical strategy. As mentioned, the EWE is a second-order effect, i.e., it refers to how the sensitiveness of changes in PR to variations in UR evolves when the percentage of UB beneficiaries varies. Thus, we carry out the second step of our strategy so as to measure this second variation.

In the second step, we make use of the rolling-window regression techniques. This procedure yields different values for the β parameters: one value for each window. As we decided to use 15-year windows, we have 26 values for β, starting in 1980-1994 and ending in 2005-2019[33].

On the other hand, we need an empirical index of the proportion of type-E workers (PTEW) within the total working-age population. In the theoretical model, labor contracts are signed at the beginning of the period.

[31] It is worth pointing out that the parameters α^{CT} in (31) and α^{HP} in (32) are expected to be statistically non-significant as the series were previously detrended.

[32] See respectively Dickey and Fuller (1979), Phillips and Perron (1988), and Kwiatkowski et al. (1992). The null hypothesis of the former two is that the series have a unit root, whereas the null hypothesis for the latter is that the series are stationary.

[33] The size of each window is always debatable. For instance, in Knotek (2007), each rolling regression uses a sample period consisting of 13 years of data. Here, we are more conservative (to gain accuracy), and the size of the window consists of 15 annual observations, as in Porras and Martín-Román (2019).

In real life, however, some workers are employed in a specific moment, other workers are looking for a job (some of them are entitled and others not), and a fraction of the total population is out of the labor force. If we make the assumption that all workers currently employed are entitled to UB (as they have, in fact, work experience), and we add them to the pool of UB beneficiaries (which, indeed, are entitled at this time), we have a reasonably good approximation of the volume of type-E individuals[34]. If we then divide them by the total working-age population, we have PTEW as shown in equation (33):

$$PTEW = \frac{B + EM}{N} \tag{33}$$

where B stands for the number of UB beneficiaries, EM is the number of employed, and N refers to the total working-age population. We are aware that the PTEW index could not measure the exact figure for the proportion of type-E individuals in a specific year because it is only an approximation. Nonetheless, we deem that it depicts reasonably well the long-run changes in that percentage. Actually, what we use in the second step is the 15-year average of PTEW, and this measure is much less affected by yearly measurement errors, reflecting the relevant movements in the long-run trend of PTEW.

The final stage of our empirical strategy consists in computing the correlation between PTEW and the group of "betas" estimated through the rolling-windows procedure. As mentioned above, we average 15-year periods of PTEW so as to match them to the corresponding estimated β belonging to the same range of years (i.e., within the equivalent window period). We managed to gather data on the number of UB beneficiaries from 1980 onwards (as far as we know, these are the longest time-series that can be obtained).

In **Figure 7,** we show those 15-year average observations for PTEW. One of the most remarkable characteristics of that figure is its positive time-trend. A second major feature is the wide variation range of the time-series. Starting with a value of 0.55 in the period 1980-1994, it ends with a value of 0.69 in the period 2005-2019. These 14 percentage points imply an increase of about 25% throughout the whole period. This figure is a significant increase, so if the phenomenon we are analyzing in this paper is relevant, such an increase could lead to substantial changes in the size of the estimated β.

[Figure 7]

[34] Previous work experience is the essential requirement to gain entitlement to UB in Spain. Hence, assuming that current employees are entitled in a (potential) future unemployment spell seems to be a realistic supposition.

According to the theory previously presented, the higher is the percentage of type-E individuals within the total working-age population, the stronger is the EWE. Consequently, we expect a negative relationship between the size of the rolling-window estimated betas (β_{RW}^{LS}, β_{RW}^{CT}, β_{RW}^{HP}) and the 15-year average PTEW ($PTEW^{15A}$). The equation (34) formalizes **Hypothesis 1** and is the empirical counterpart of equation (27):

$$\frac{\partial \beta_{RW}^{i}}{\partial PTEW^{15A}} < 0 \qquad (\forall i = LS, CT, HP) \tag{34}$$

4.3. Results

Table 2 shows the results of the estimation of equations (30) through (32). We break down the estimates into a twofold classification. First, the set of columns (1)-(3) refers to the three different econometric procedures above-mentioned (LS, CT, and HP). Second, we also carry out the empirical analysis for three different periods. The first one covers the whole time horizon and ranges from 1980 to 2019. The other two are the sub-periods 1980-1999 and 2000-2019, aiming at checking the stability of the estimates for the whole period. As a result of this, we obtain nine estimates for beta.

[Table 2]

Overall, the results exhibit a high degree of consistency among the three econometric methods. For the whole period, both the LS and CT and HP estimates show no statistically significant effect of the business cycle on the PR. For the sub-period 1980-1999, the three procedures find a positive and significant relationship between the PR and the business cycle (i.e., the PRs are pro-cyclical in these years). Finally, for the sub-period 2000-2019, both LS and HP did not find a statistically significant relationship, while the CT procedure estimates a counter-cyclical behavior of the PR, significant at the 5% level.

At first glance, the absence of a significant relationship between the PR and the business cycle for the whole period could make the naïve observer think that the AWE and the DWE are of similar strength and offset each other. However, the reality behind the data is a lack of stability of the estimated parameter. The estimated betas for the two sub-periods confirm this view. Within the time span from 1980 to 1999, the cyclical sensitivity of the PR to business cycle movements is estimated significantly in the range of 0.19 to 0.25. On the other hand, the LS and HP estimates for the period 2000-2019 are not statistically significant, and the CT method produces a beta of -0.05, implying a counter-cyclical behavior of the PR.

Bearing in mind this empirical evidence, we check if the decline in the pro-cyclical behavior in the PR occurs suddenly or if, on the contrary, it is a gradual phenomenon. And, in the case of being a gradual phenomenon, we

also attempt to determine if the secular increase of the PTEW shown in **Figure 7** is a major driving factor. With this aim, in a first stage, we calculate a continuum of estimated betas through a set of rolling-window regressions. This is what is displayed in **Table 3**. Then, in a second stage, we look for evidence of the second-order EWE by correlating the estimated betas with the 15-year average of PTEW.

[Table 3]

In order to facilitate the interpretation of the results, we have represented the estimated betas from **Table 3** in **Figure 8**. Two stylized facts can be observed in **Table 3** and **Figure 8**. First, there is a clear negative trend in the estimated betas (as we move forward in time). Second, although there are slight differences in the order of magnitude of estimated betas regarding different econometric techniques, we find a high degree of correlation among them. To be more precise, the correlation coefficient between the series of β^{LS} and β^{CT} is $r = 78.2\%$, between β^{LS} and β^{HP} is $r = 83.7\%$, and between β^{CT} and β^{HP} is $r = 96.0\%$.

[Figure 8]

Furthermore, it should be emphasized the strong pro-cyclical pattern in the Spanish PR at the beginning of the period. For instance, the LS estimated parameter for the period 1980-1994 indicates that a 1-percentage point reduction in the unemployment rate would raise the PR by 0.28 percentage points. The CT and the HP estimates yield a similar outcome, 0.26 and 0.25, respectively. Moreover, the estimates are highly significant from a statistical point of view. As we progress in time, there is a steady decrease in the size of the calculated betas. It is also worth mentioning that, in the final years, some estimated parameters are no longer statistically significant (at the conventional levels), which is logical as the point estimates are in fact close to zero. Put in other words, the above-mentioned TNE is close to zero because of the composition effects of the AWE, the DWE, and the EWE. Even more importantly, in the very last years, the three methods produce negative values for the estimated betas, implying a counter-cyclical pattern in the PR.

As illustrated by the previous analysis, the fall in the pro-cyclical behavior of Spanish PR is a progressive process. For this reason, we consider that the loss of procyclicality observed in the Spanish labor supply during the last years is a consequence of structural factors, not of short-term factors. As our theoretical framework establishes, we believe that the EWE is operating more intensively now that in the past and, consequently, weakening the DWE in recent years. The support for this statement can be found in **Figure 7**. As can be seen, the PTEW has reached its highest levels precisely in the last years.

After having computed the 15-year rolling-window estimates for beta, in the second and final step of the empirical strategy, we proceed to correlate

them with their equivalent 15-year average of PTEW. **Figure 9** shows this empirical exercise. We represent PTEW on the X-axis and beta on the Y-axis. In the upper panel, we display the betas obtained through LS, in the bottom-left, those calculated with the CT procedure, and in the bottom-right, the HP estimates.

[Figure 9]

Two essential conclusions can be drawn from the observation of **Figure 9.** First, there exists a negative correlation between the rolling-window betas and PTEW, as predicted by the model. Second, that correlation seems to be pretty high. More specifically, the correlation coefficient in the LS case is $r = 85.6\%$, $r = 93.5\%$ for the CT procedure, and $r = 98.8\%$ for the HP estimates. These empirical results give credit to the theory developed in this article. In other words, **Figure 9** is proof of the importance and significance of EWE.

5. Discussion and conclusions

This paper identifies and analyses a new effect as regards the cyclical behavior of labor supply that we dub the Entitled Worker Effect. To this end, we build a formal model in which we explicitly characterized the three theoretical channels recognized: the AWE, the DWE, and the EWE. The key point of this research is that the EWE has its own nature and is different from the two well-known effects concerning the labor supply and the business cycle (i.e., the AWE and the DWE).

The central prediction of the model is that there should be a negative correlation between the cyclical sensitivity of the PR and the PTEW. Put differently, the higher the level of PTEW is, the stronger the EWE should be. The rationale for that outcome is, according to the model, that the EWE weakens the DWE and makes the PR less pro-cyclical. However, it is important to stress that the theoretical channel operating has nothing to do with a stronger income effect (i.e., a larger AWE) or with an unexplained change in the way the expectations affect labor supply choices (i.e., an unexplained decrease in the DWE). It has to do with the moral hazard created by an increasing proportion of people entitled to receive UB.

The empirical evidence seems to support this interpretation of the facts. First, we observe a steady decline in the pro-cyclical sensitivity of the PR to the business cycle from 1980 to the present. Furthermore, the three econometric methods used (LS, CT, and HP) yield a similar evolution of the point estimates for that cyclical sensitivity, which is a sign of the robustness of the results. Second, this continuous decline in the estimated betas as time goes on coincides with a secular increase in the PTEW. When computing the correlation between the two variables, it is very high. Although it is a simple correlation and we do not perform a causality test, it is difficult to think of a reason for expecting a reverse causal-effect from cyclical sensitivity to the PTEW. Anyhow, this might be a field for future research. Also interestingly,

in the last "windows" of our rolling regression analysis, we detect a counter-cyclical pattern of the PR. Determining if this empirical regularity is going to consolidate in the coming years appears to be an appealing avenue for future research.

The policy implications are potentially profound. Traditionally, when the PR exhibited a counter-cyclical behavior during a downturn, it was assumed that the unemployment rate was overstated. The policy prescription for the Government was to reduce the fiscal stimulus, as the "actual" number of unemployed persons was less than that recorded in the official data. Thus, the aggregate demand management policy is the canonical recommendation. However, if the EWE is a major driving factor behind the weakening of the pro-cyclical movements of the PR, policymakers, on the contrary, must use supply-side measures to fight against the moral hazard problem addressed in this piece of research. To sum up, as the EWE appears to be an issue, economic authorities must monitor the UB system carefully to attempt to minimize the underlying opportunistic behavior. This political action, at the same time, would alleviate the financial difficulties that Social Security systems are facing nowadays in many countries.

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Table 1. Unit roots tests

	ADF		PP		KPSS	
	statistic	p-value	statistic	p-value	statistic	5% level
ΔPR (16-64)	-4.660	0.000	-4.784	0.000	0.196	0.463
PRCT (16-64)	-2.058	0.039	-2.218	0.027	0.085	0.463
PRHP (16-64)	-3.254	0.002	-3.279	0.002	0.099	0.463
ΔUR	-3.078	0.036	-3.176	0.029	0.085	0.463
URCT	-3.298	0.002	-2.065	0.039	0.069	0.463
URHP	-3.659	0.001	-2.429	0.016	0.052	0.463

Notes: All the tests were carried out for the period 1980-2019. ΔPR stands for the first difference of the participation rate. PRCT is the cyclical gap after the Cubic Trend filtering procedure. PRHP is the cyclical gap attained after the Hodrick-Prescott decomposition. The same applies to the unemployment rate (UR). In the HP and CT tests, neither a constant nor a trend were included. In the first difference transformation, a constant was included but not a trend.

Table 2. Cyclical sensitivity of PRs.

	(1) LS Coeff. (p-value)		(2) CT Coeff. (p-value)		(3) HP Coeff. (p-value)	
PR 16-64						
1980-2019						
Constant	0.415***	(0.00)	0.075	(0.54)	0.006	(0.93)
Beta	0.025	(0.53)	-0.016	(0.52)	0.046	(0.14)
D2001	-1.384***	(0.00)	-2.061***	(0.00)	-1.552***	(0.00)
N	40		40		40	
R^2	0.13		0.19		0.26	
$\overline{R^2}$	0.08		0.15		0.22	
1980-1999						
Constant	0.304***	(0.00)	0.155	(0.50)	-0.010	(0.89)
Beta	0.251***	(0.01)	0.191*	(0.06)	0.224***	(0.00)
D2001	-	-	-	-	-	-
N	20		20		20	
R^2	0.47		0.20		0.61	
$\overline{R^2}$	0.44		0.15		0.59	
2000-2019						
Constant	0.551***	(0.00)	0.183	(0.19)	0.127	(0.14)
Beta	-0.053	(0.37)	-0.047**	(0.05)	-0.021	(0.44)
D2001	1.400***	(0.00)	-2.024***	(0.00)	-1.530***	(0.00)
N	20		20		20	
R^2	0.26		0.50		0.52	
$\overline{R^2}$	0.18		0.44		0.46	

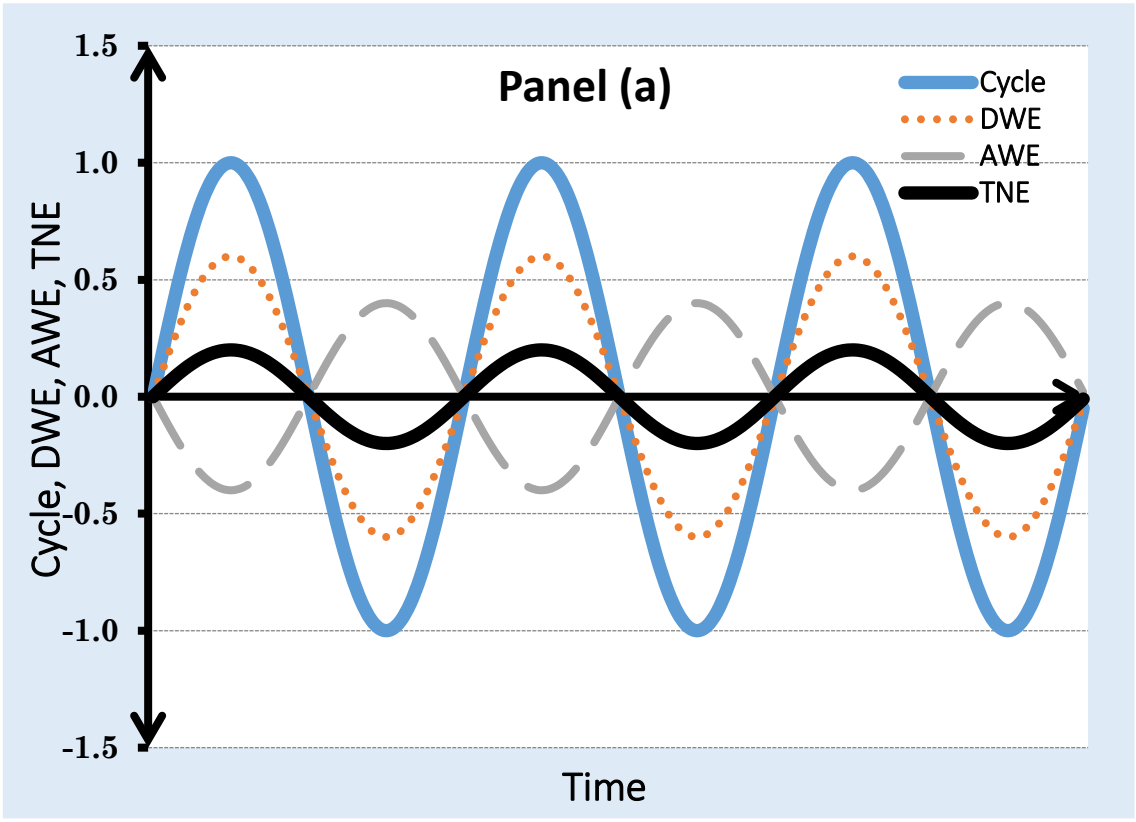
Notes: The set of columns (1) trough (3) refers to Least Squares, Cubic Trend and Hodrick-Prescott estimates respectively. The coefficient captures the relationship between the variation of PR and (minus) the variation in prime-age males UR. t-statistics and p-values are calculated using White (1980) heteroskedasticity-consistent standard errors. *** means significance at 1% level, ** significance at 5% level and * significance at 10% level.

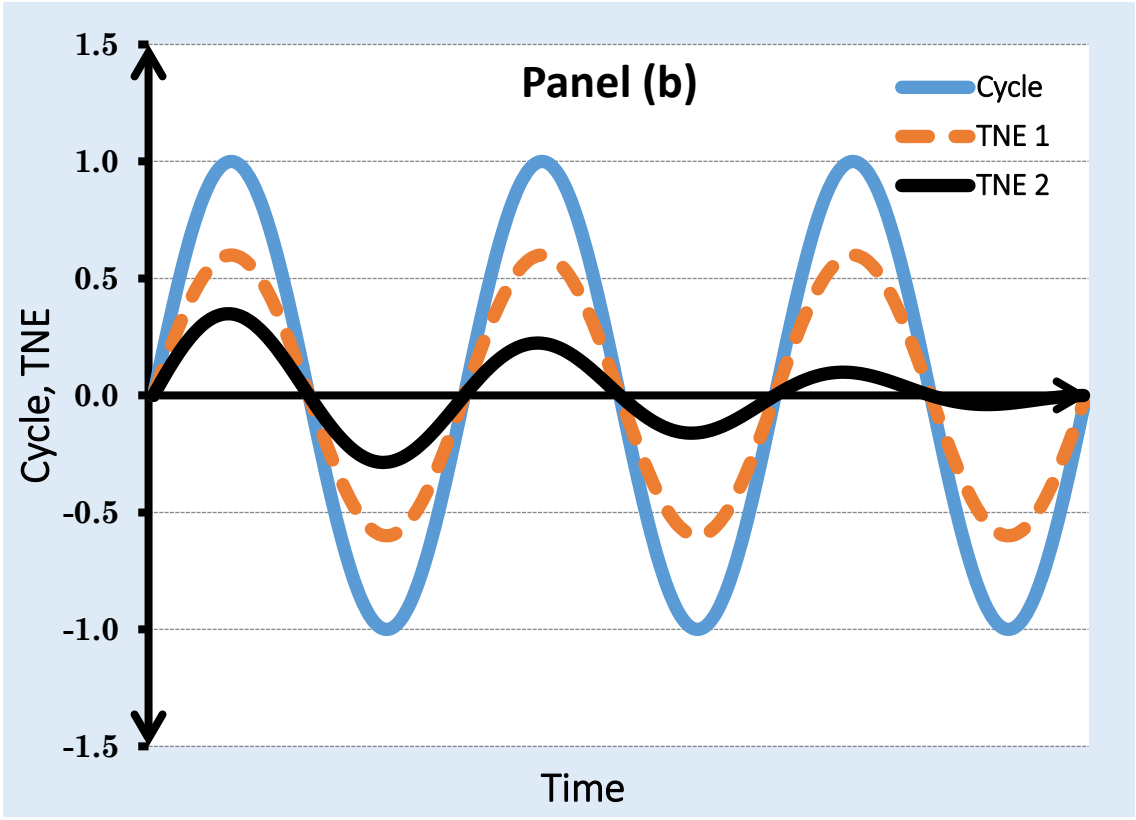
Table 3. Beta estimates of the rolling-window regression.

	(1) LS			(2) CT			(3) HP		
	Coeff.	**p-val.**	**R^2**	**Coeff.**	**p-val.**	**R^2**	**Coeff.**	**p-val.**	**R^2**
PR 16-64									
1980-1994	0.281	0.033	0.46	0.256	0.000	0.61	0.245	0.001	0.64
1981-1995	0.234	0.062	0.38	0.291	0.000	0.64	0.243	0.000	0.66
1982-1996	0.221	0.064	0.36	0.310	0.000	0.63	0.237	0.000	0.68
1983-1997	0.227	0.048	0.38	0.321	0.000	0.59	0.234	0.000	0.69
1984-1998	0.211	0.036	0.36	0.281	0.001	0.41	0.235	0.000	0.68
1985-1999	0.200	0.042	0.33	0.218	0.051	0.24	0.226	0.000	0.63
1986-2000	0.200	0.027	0.29	0.175	0.091	0.16	0.211	0.000	0.61
1987-2001	0.204	0.029	0.58	0.180	0.113	0.36	0.187	0.000	0.81
1988-2002	0.075	0.474	0.37	0.113	0.255	0.29	0.171	0.001	0.72
1989-2003	0.055	0.614	0.34	0.095	0.208	0.32	0.151	0.002	0.77
1990-2004	0.080	0.473	0.39	0.079	0.169	0.36	0.133	0.008	0.76
1991-2005	0.100	0.376	0.41	0.076	0.101	0.44	0.106	0.007	0.78
1992-2006	0.093	0.447	0.44	0.097	0.058	0.53	0.102	0.002	0.81
1993-2007	0.014	0.921	0.49	0.125	0.017	0.59	0.101	0.000	0.82
1994-2008	-0.081	0.387	0.57	0.155	0.005	0.57	0.119	0.000	0.81
1995-2009	0.023	0.665	0.54	0.089	0.351	0.35	0.098	0.031	0.69
1996-2010	0.047	0.241	0.60	0.013	0.871	0.29	0.063	0.139	0.63
1997-2011	0.055	0.127	0.58	-0.032	0.529	0.33	0.037	0.317	0.61
1998-2012	0.070	0.041	0.58	-0.051	0.110	0.42	0.008	0.762	0.62
1999-2013	0.088	0.006	0.54	-0.043	0.116	0.51	0.004	0.849	0.69
2000-2014	0.052	0.346	0.42	-0.028	0.274	0.58	0.011	0.545	0.74
2001-2015	0.001	0.985	0.38	-0.020	0.441	0.60	0.011	0.565	0.73
2002-2016	-0.023	0.676	0.01	-0.021	0.402	0.04	0.009	0.629	0.01
2003-2017	-0.042	0.390	0.05	-0.017	0.463	0.03	0.004	0.841	0.00
2004-2018	-0.054	0.207	0.11	-0.025	0.331	0.06	-0.009	0.728	0.01
2005-2019	-0.057	0.176	0.12	-0.034	0.201	0.10	-0.018	0.509	0.03

Notes: The set of columns (1) trough (3) refers to Least Squares, Cubic Trend, and Hodrick-Prescott estimates respectively. As mentioned in the text, the coefficient captures the relationship between the variation of PR and (minus) the variation in prime-age males UR. T-statistics are calculated using White (1980) heteroskedasticity-consistent standard errors.

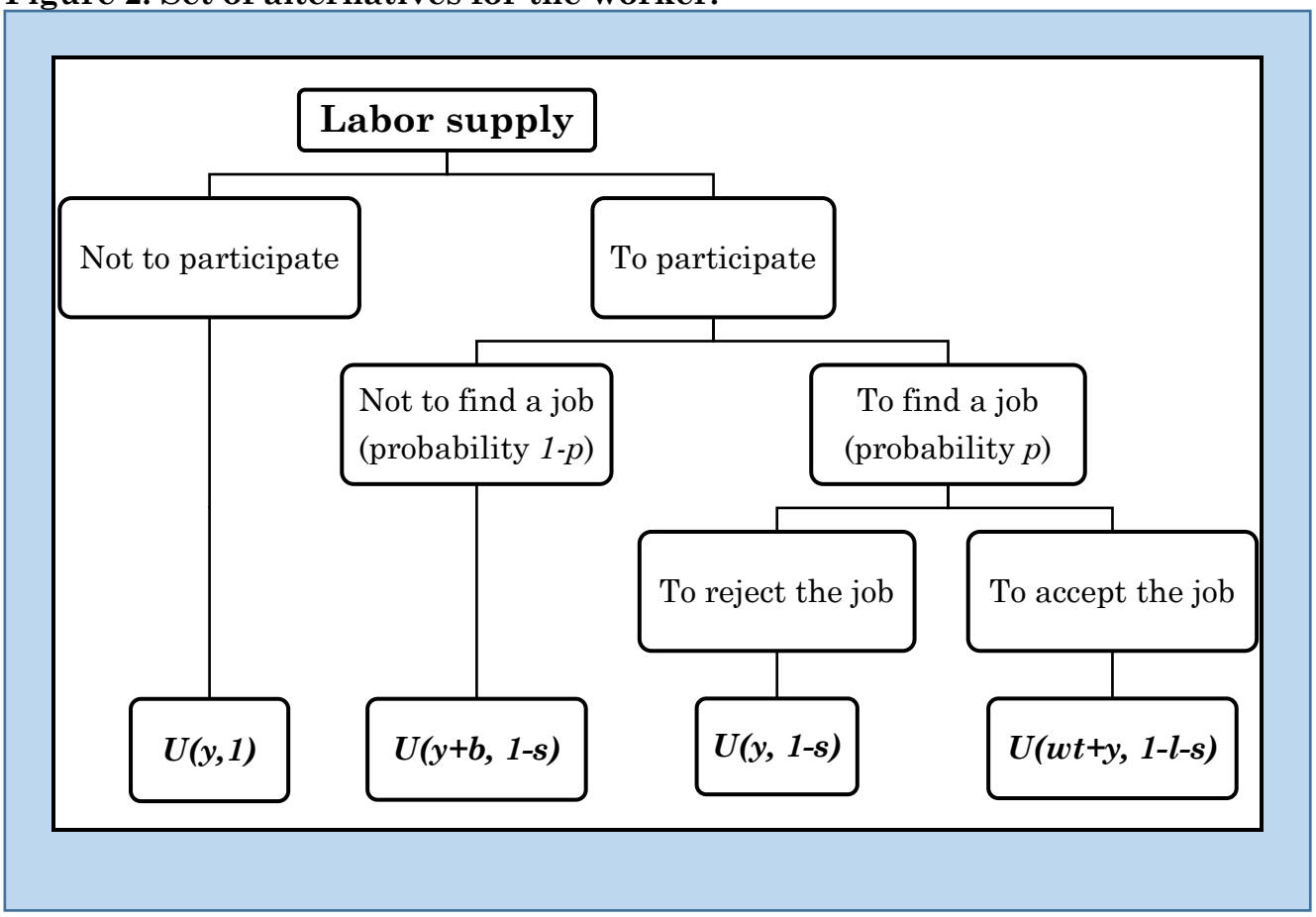
Figure 1. Business cycle, AWE, DWE and Total Net Effect





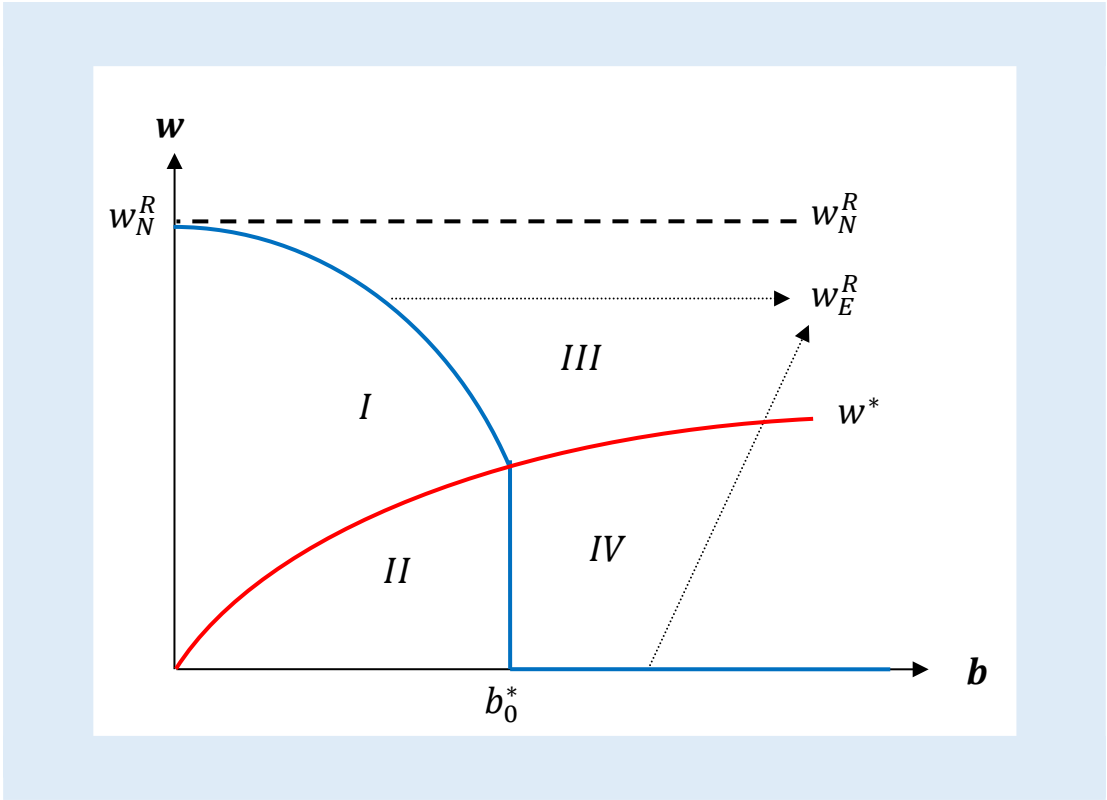
Source: Own elaboration.

Figure 2. Set of alternatives for the worker.



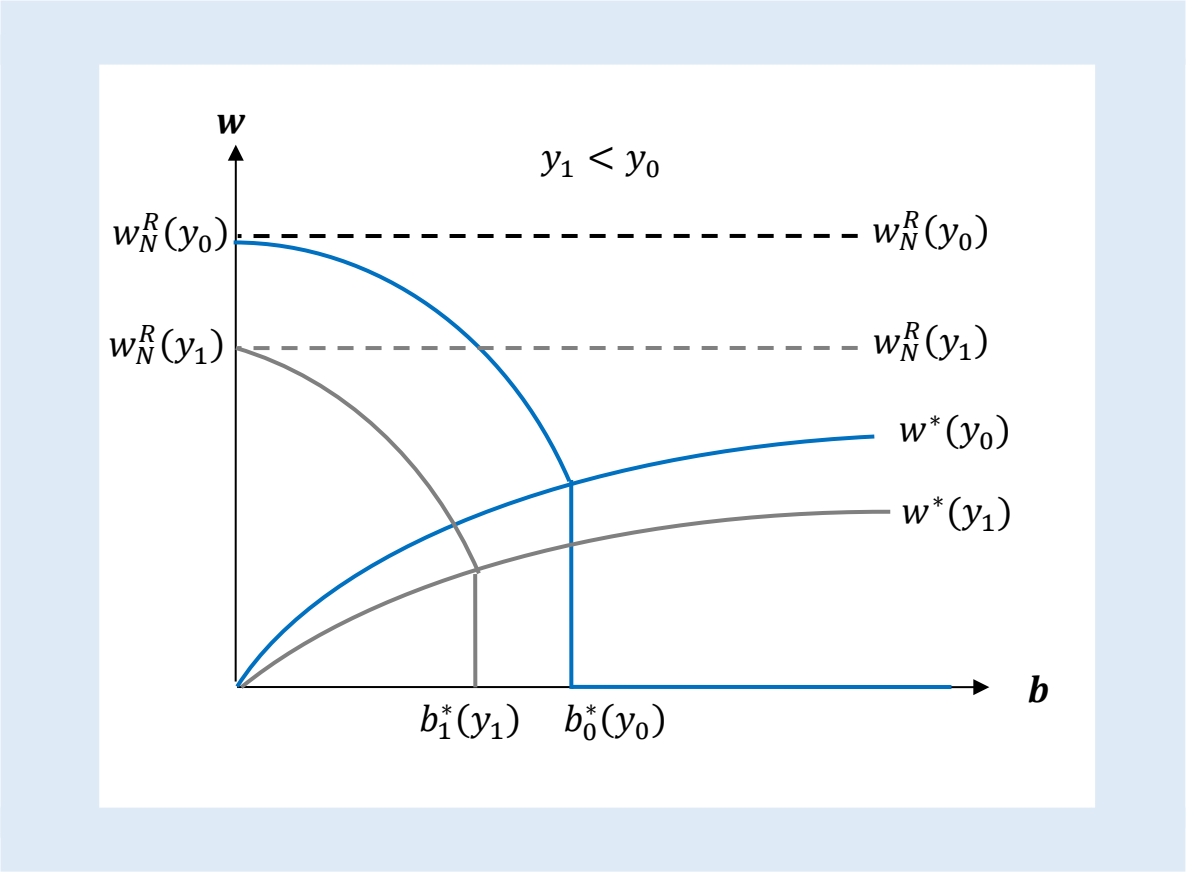
Source: Own elaboration.

Figure 3. Reservation wage and UB



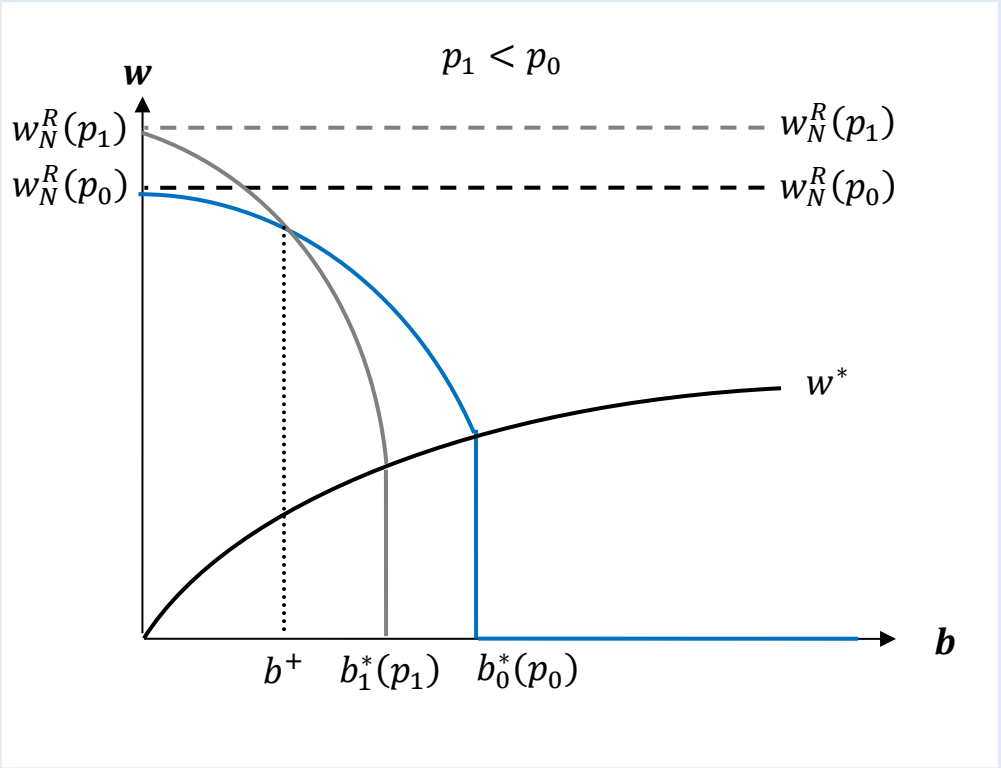
Source: Own elaboration.

Figure 4. Reservation wage and non-labor income variations.



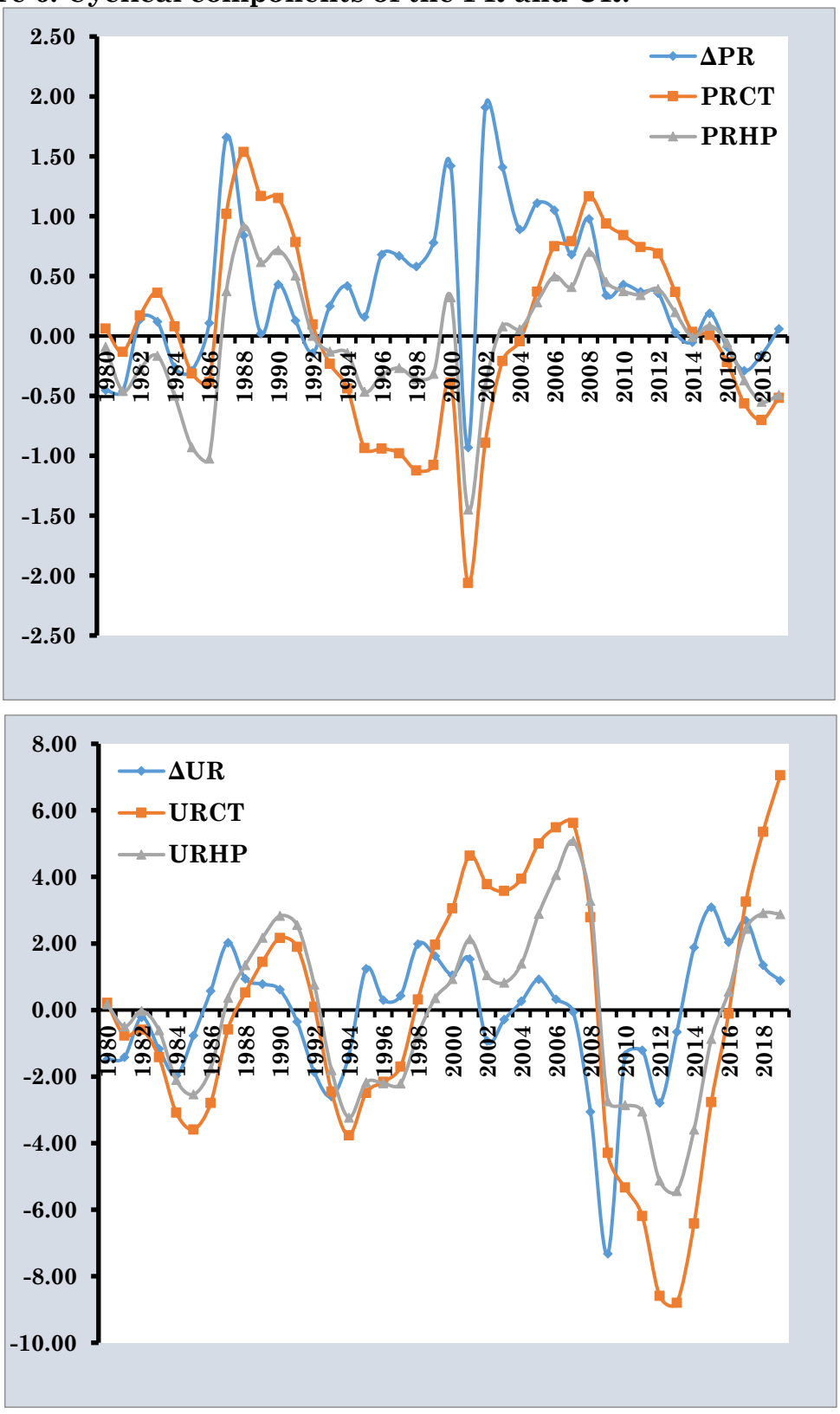
Source: Own elaboration.

Figure 5. Reservation wage and the likelihood of finding a job.



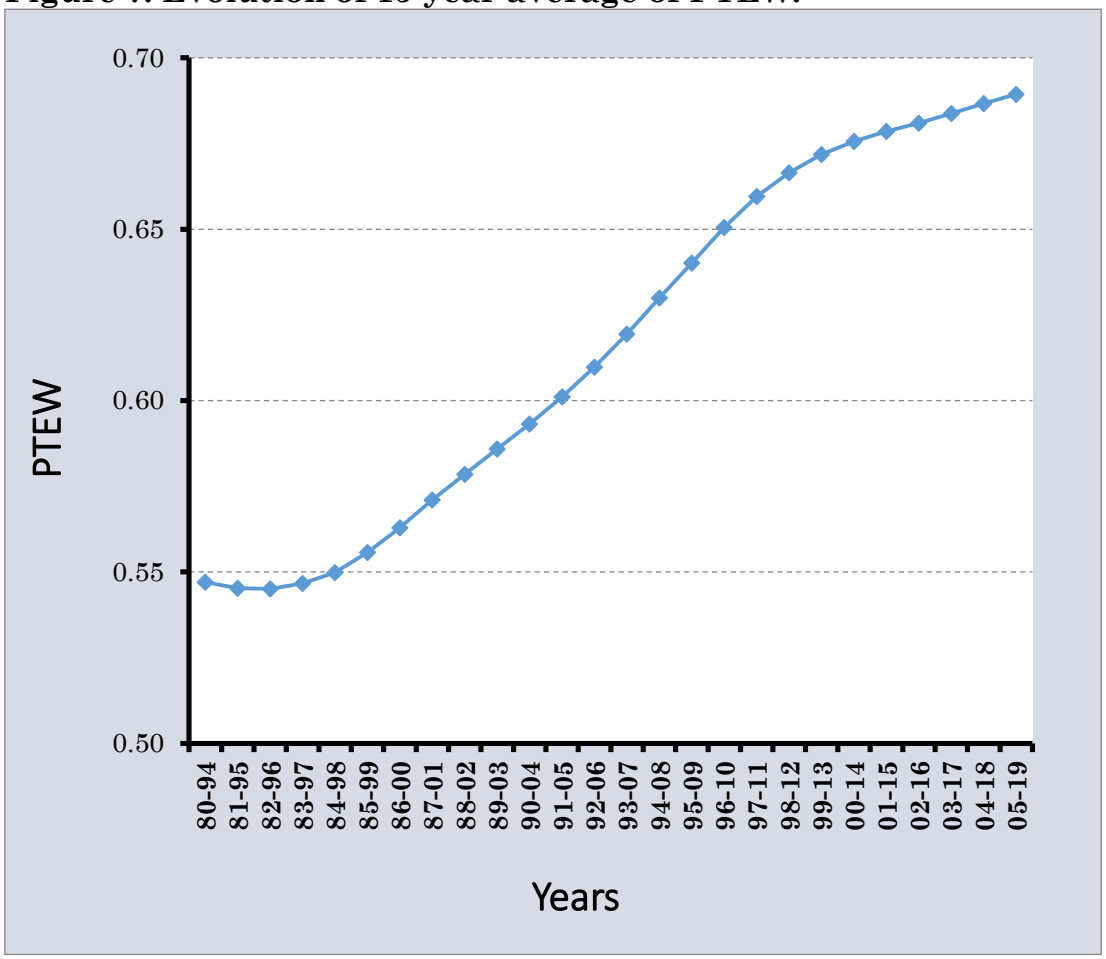
Source: Own elaboration.

Figure 6. Cyclical components of the PR and UR.



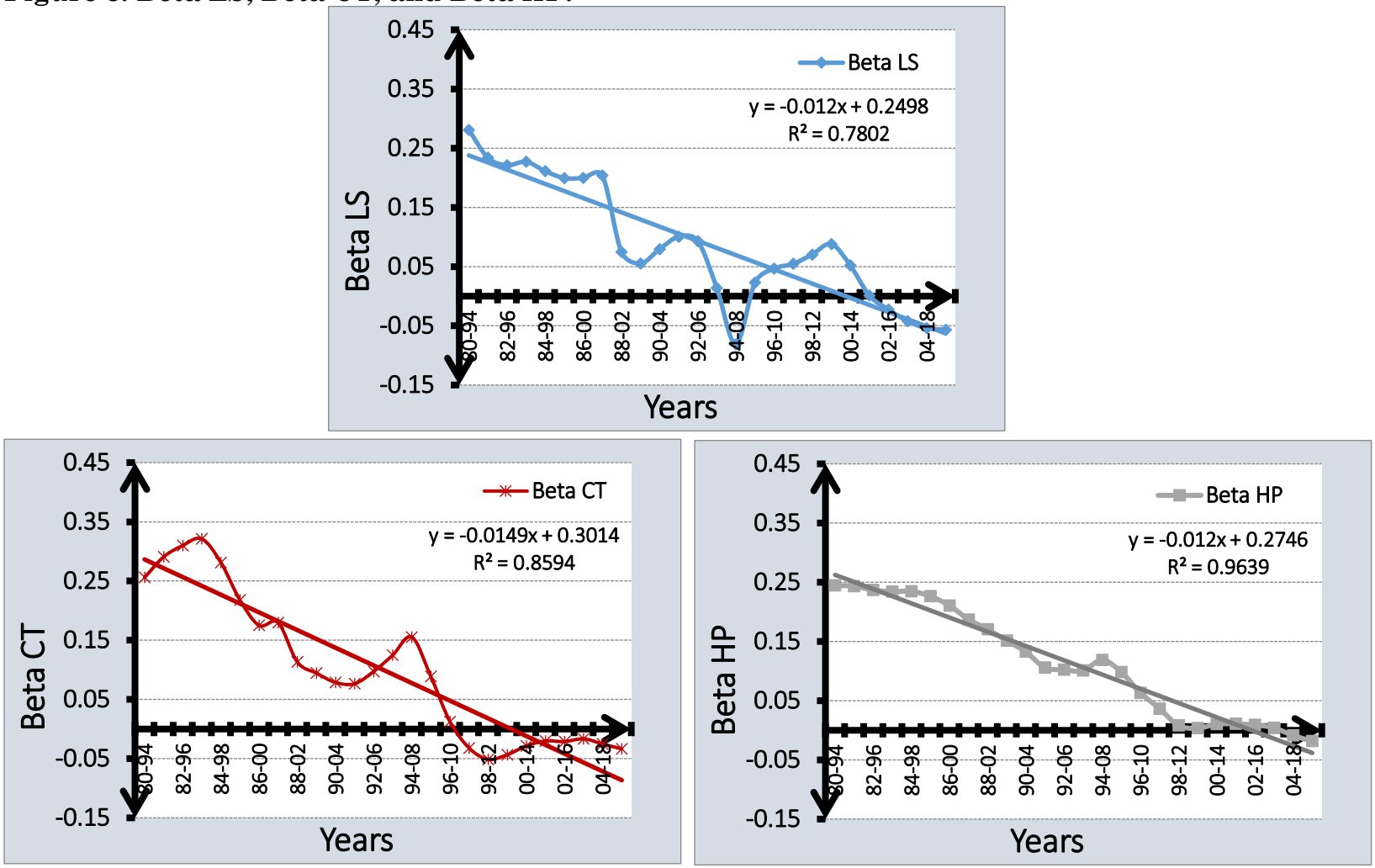
Source: Own elaboration.

Figure 7. Evolution of 15-year average of PTEW.



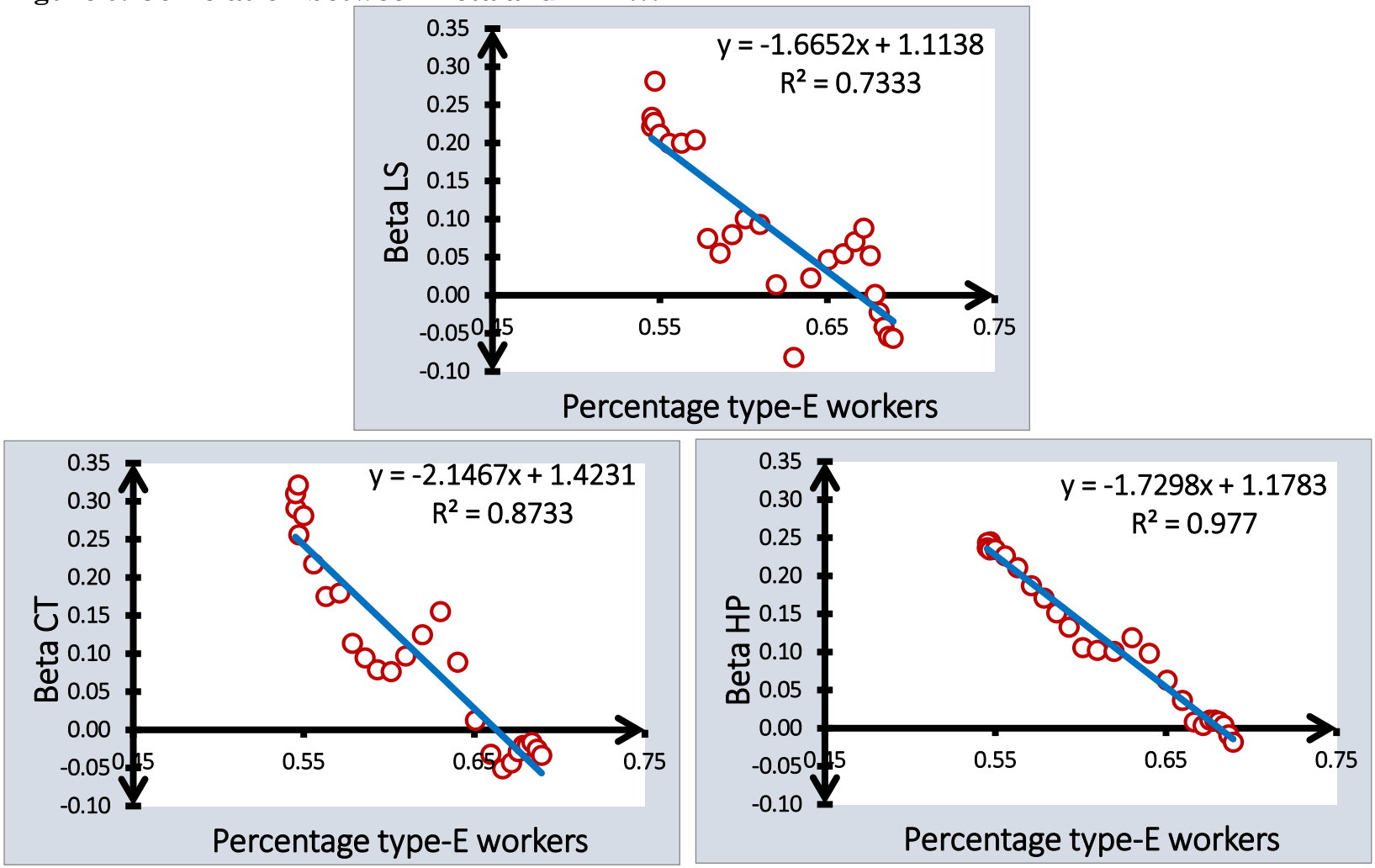
Source: Own elaboration.

Figure 8. Beta LS, Beta CT, and Beta HP.



Source: Own Elaboration.

Figure 9. Correlation between Beta and PTEW.



Source: Own elaboration.